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### REMARKS

This amendment includes the subject matter of the un-entered amendment under Rule 116 and further presents alternative additional claims responsive to the Examiner's remarks during the prior interview and in the Advisory Action.

Applicants' attorney wishes to thank the Examiner for the courteous interview granted on April 27, 2004 to co-inventor Hannu Leino and the undersigned. During the interview, alkalinity stabilization during stock preparation within the paper mill was discussed with reference to the Leino declaration. This discussion readily distinguished the improvements of the invention, and it is summarized herein.

With particular reference to figures 1 - 3 of the Leino declaration, the pulping operation and the pulp mill water circulation are shown on the left side of the figure, separated by the dotted line, from the stock preparation and paper mill water circulation (or white water circulation) shown on the right side of the figure.

Accordingly, the figures reflect the conventional separation of fluid flows in integrated mills. That is, the pulping fluid or water flows are recycled and retained in the operations of the fiber line of the

pulp mill. This recycle and separation is assisted by the pressing of the pulp in the "Sunds Press" with recycle and discharge of the filtrate, as shown in the declaration figures. Thus, the pressed or increased consistency pulp is passed to the paper mill, or shipped to a remote paper mill in a non-integrated plant, with very little of the pulp mill water.

On the other hand, the stock preparation flows comprising the white water and short circulation flows are recycled and retained in the paper mill. As noted above, very little of the pulp mill water is retained in the pressed or increased consistency pulp delivered to the stock preparation on the paper side. Of course, in non-integrated mills, the pulp is delivered to the paper mill and the invention is practiced in the paper mill.

With these differences in mind, the Examiner particularly requested further clarification that the pulping operation teachings in the Ostberg reference do not suggest the claimed invention and that the claims are directed to processes in the paper mill downstream of, or following, pulp preparation in the fiber or pulp mill.

The Ostberg reference is fully discussed in the response to the claim rejections. Accordingly, it is

most convenient to first address the amendments in the claims. Each of the independent claims 1, 11 and 13 has been amended to specifically recite addition of the alkalinity increasing components "in the stock preparation" and "in a paper mill". Both of these phrases are supported throughout the specification.

The definition of the phrase "stock preparation" has been previously shown by the text submitted with the amendment dated December 23, 2002. Namely, "Papermaking Part 1, Stock Preparation and Wet End", page. 125, an extra copy being submitted for the Examiner's convenience. As noted in the text, in the papermaking art:

"Stock preparation or 'stock prep' includes mechanical treatment of the stock before the machine chest, proportioning, and blending of the main stock components. Stock preparation begins with repulping or the dilution of pulp from integrated mill operations at the pulp storage towers and ends at the machine chest." (*Emphasis added.*)

There are submitted herewith additional dictionary copies of definitions of the phrases "stock preparation" and "stock preparation system".

- 1) Pulp & Paper Dictionary, Third Edition,  
Editor Lavigne, page 379; and
- 2) Dictionary of Paper, 5th Edition, Editor  
Kouris, page 291.

These definitions show that the stock preparation takes place after the removal of water in the pulp mill and begins with the repulping or dilution of this pulp in the paper mill. It is unambiguously clear from all of the definitions that the stock preparation does not refer to operations performed in a pulp mill.

This definition of stock preparation has not been shown to conflict with other texts or authorities in the art, and applicants offer to incorporate this kind of definition of the stock preparation into the specification in order to remove any misinterpretation of the same. The Examiner has not previously recognized the sufficiency of the phrase "stock preparation" to distinguish the present invention from pulp mill practices, and the incorporation of the definition would provide a language precision to overcome any ambiguity that may have heretofore concerned the Examiner.

Consistent with this definition of stock preparation, the claim limitations have been further clarified by recitation of "a paper mill". That is,

the stock preparation is indicated to occur in a paper mill as opposed to a pulp or fiber mill. The combination of terms leaves no doubt as to the meaning of the claim limitation.

Lastly, it is noted that each of the independent claims references the achievement of a significant buffering effect and maintaining the pH at the desired level "from the addition of the feeds throughout the short circulation and formation of paper on the paper machine" or "the formation of the pulp suspension into a web". Thus, it is clear that stabilization of alkalinity has been provided in the paper mill in respect to the short circulation and the paper machine (claims 1, 16 and 25) or the formation of the pulp suspension into a web (claims 11, 13 and 19).

Reference to the short circulation is supported throughout the specification. Example 2 particularly illustrates alkalinity control by addition of alkali and  $\text{CO}_2$  to the pulp slusher in increased amounts as compared with reference Example 1, and it is noted in the last paragraph at page 6 that:

"Because of the buffering effect of the combined  $\text{NaOH}$  and  $\text{CO}_2$ , the acidic conditions lower the pH only to pH 7.2. This is a suitable pH for the

short circulation and there is no need for any pH control using NaOH."

It is respectfully submitted that the amended claims introduce no new issues, and comply with the Examiner's request for more specificity in identification of application of the invention to the stock preparation in the paper mill to assure alkalinity control in the wet end of the paper making from the feed point of the alkali/CO<sub>2</sub> to the paper machine or the web formation.

In a further effort to assuage the Examiner's concerns and confirm that the inventive alkalinity control occurs downstream of the pulp or fiber mill, newly presented claim 14 specifically recites that the:

step of providing said paper making pulp suspension includes adding water to bales of pulp or adding water to pulp of increased consistency coming from a pulp mill.

The bale recitation is supported by Examples 1 and 2 and the increased consistency recitation is supported by Examples 6 and 7. Further, each of these recitations is necessarily directed to processing downstream of the pulp mill and within the paper mill. There is no other interpretation of the limitation.

Newly presented claims 17, 19, 21 and 23 contain corresponding limitations.

Newly presented claim 15 further emphasizes pH and alkalinity control in accordance with the invention. Accordingly, the claim is directed to disclosed and illustrated ranges of sodium hydroxide and carbon dioxide additions found to be useful for alkalinity regulation. The claim is particularly supported by page 4 of the specification and by Examples 5 and 9 in the specification. Newly presented claims 18, 20, 22 and 24 contain similar limitations.

Newly presented claim 16 is similar to claim 1, and further recites increasing the alkalinity of the paper making pulp suspension "by adding to the water circulation system of pulp and white water" the alkali metal hydroxide and carbon dioxide feeds. This limitation is particularly supported at page 5 of the application where the feeds to the pulp circulation system are referenced in the first full paragraph for purposes of the avoidance of pH fluctuation in circulating white water as referenced in the fifth paragraph. As the Examiner is well aware, the white water circulation does not occur in the pulp mill and the claim limitation necessarily restricts the



invention to the downstream or remote paper making operations.

Newly presented claim 25 further clarifies that the inventive process occurs after the pulp mill and, to that end, recites "comprising providing a papermaking pulp suspension in a paper mill after a pulp mill and increasing the alkalinity of said pulp suspension by adding thereto". The claim is otherwise similar to claim 1.

Newly presented claim 26 is directed to the addition of the feeds to the circulation of pulp and white water of the paper machine.

Turning to the claim rejections, it is requested that the Examiner reconsider and withdraw the rejection of claims 1-7 and 9-13 under 35 USC 103(a) as unpatentable over Ostberg et al. with or without G.B. patent 815,527 with or without U.S. patent 6,086,714 to Plaskon et al. As noted above, the present invention is directed to alkalinity control in the paper mill downstream from the pulp or fiber mill.

Ostberg never mentions stabilization of pH through increased alkalinity or alkalinity control as contemplated in the present invention. As the Examiner is aware, pH regulation does not necessarily mean alkalinity control. That is, pH regulation per Ostberg

merely contemplates the addition of alkali or acid to achieve a target pH at particular process locations. For example, Ostberg merely teaches adding an alkali to increase an undesirably low pH. In contrast, the invention contemplates the addition of both alkali and CO<sub>2</sub> to achieve increased alkalinity as well as the target pH.

As discussed during the interview, Ostberg is particularly directed to processing in the fiber line of the pulp mill. This is clear from the title of the article and the description of processing in "Fibre line 1" and "Fibre line 2". The Summary states:

"Carbon dioxide (CO<sub>2</sub>) can be used for pH adjustments and to improve the washing performance in the production of sulphate pulp."

Ostberg does not address increasing alkalinity to achieve buffering and increased resistance to pH change. Ostberg does not relate to the production of paper.

In Ostberg, all the addition points, CO<sub>2</sub> and alkali (when added), are clearly in the fiber line. Since the alkalinity is a property of the aqueous phase of the pulp suspension, any alkalinity created in Ostberg would be retained in the fiber line when the pulp from the fiber line is dewatered and the excluded

water is circulated back to the fiber line. As discussed during the interview, the pressing of the pulp so as to remove the pulp mill water before passing the pulp to the stock preparation in the paper mill is inconsistent with alkalinity control downstream. For this reason, it is not plausible to construe Ostberg's fiber line processing to teach or suggest alkalinity control in the stock preparation in the paper mill, as discussed during the interview.

The pulp entering the paper mill has been dewatered and, as such, has a very low alkalinity and therefore, although it may have an even pH at about 8, this pH does not provide a sufficient alkalinity to maintain the pH of the pulp (and the whitewater) at an even value if chemical additions and treatments affecting the pH are made in the stock preparation. The Leino declaration notes that the pulp leaving the fiber mill has very low alkalinity (buffering ability), both under conventional processes or under the "AGA Pulp Wash System" referred to in Ostberg.

It should be appreciated that the alkalinity in the suspension in the stock preparation will actually be provided by the water (whitewater) which is used to dilute the pulp in the stock preparation and in the short circulation so that at the end, in the short

circulation the pulp suspension contains about 1% or less fibers and about 99% water. Accordingly, one skilled in the art would not construe Ostberg's fiber mill processes to teach or suggest alkalinity control in the stock preparation.

The carbon dioxide added in the fiber line in Ostberg has two effects on the pulp suspension in the fiber line. It lowers the pH of the pulp and it creates an inherent, although low, buffering effect in the aqueous suspension and in the water circulation in the fiber line. The buffering provides an even pH of the pulp suspension in the fiber line. This is described by Ostberg on page 515 of the article.

The buffering effect is created in the aqueous medium of the fiber line. It causes the pH of the pulp being fed to the paper mill to have an even pH. It is evident that this is a benefit for the paper production since fluctuations in the incoming pH would automatically make it difficult to provide an even pH in the paper mill. Thus, the even pH is a benefit for the paper mill as stated by Ostberg.

Ostberg does not say that the buffering extends to the paper mill. Ostberg says that the low pH of 8 is a benefit for the paper mill.

This low pH does not, however, mean that the pulp suspension has an increased alkalinity. The alkalinity is a property of the aqueous phase of the pulp suspension and since the water has been largely retained in the fiber line, the pulp suspension in the stock preparation will have the alkalinity of the water circulation of the stock preparation. It is the stock preparation pulp that the invention stabilizes against pH fluctuations. This stabilization is done in the stock preparation by greatly increasing the alkalinity by adding the combination of components of the present invention. This increased alkalinity provides a pH which is the desired one even though the further processing also contemplates adding chemicals or otherwise treating the pulp in the stock preparation in a manner which tends to change the pH up or down.

In the interview, the Examiner particularly requested clarification of the Ostberg statement at page 515: "Advantages can also be found in the lower pH in the pulp to the paper machine". Due to the lower pH, the fibers are shrunk when entering the paper mill and if they are beaten (refined) at that pH, this is beneficial for the beating as also mentioned by Ostberg at page 515. The quoted statement does not relate to buffering capacity since such does not per se have an

effect on the fibers. However, the low pH directly affects the fibers of the pulp suspension in the fiber mill as it reduces their swelling, as mentioned by Ostberg in the last paragraph at page 509.

In further confirmation of the foregoing reading of Ostberg, reference is again made to the previously filed Ostberg declaration, and particularly, to paragraph 15 wherein it is stated that no CO<sub>2</sub> was added to the stock preparation. Thus, Ostberg did not provide an increased alkalinity in the stock preparation by adding CO<sub>2</sub> and alkali in the stock preparation as set forth in the claims of the present invention.

Referring to paragraph's 10 and 11 of the Ostberg declaration, it is stated that the alkali was used by the mill now and then to control the pH at the time before the test runs with carbon dioxide washing were started. When the carbon dioxide pulp wash started, the mill found that the pH of the pulp was in control without alkali since the CO<sub>2</sub> amount adjusted the pH to about 8. This is what Ostberg describes at page 515 of the reference.

Frankly, Ostberg did not increase the alkalinity of the paper mill pulp in the stock preparation by adding either carbon dioxide or alkali to the stock

preparation of a paper machine. There is no reasonable, or even plausible, interpretation of Ostberg that suggests the same.

It is submitted that the secondary references do not remedy the foregoing deficiencies of Ostberg. G.B. 815,247 does not teach or suggest a significant buffering effect that lasts throughout from the feed points through "the short circulation and formation of paper on the paper machine" or "the formation of the pulp suspension into a web". Furthermore, any buffering achieved in the '247 patent is overcome in the subsequent bleaching and acidification steps. (See page 2, lines 51-112, especially lines 103-107). Thus, the '247 patent actually teaches away from the claimed invention.

Assuming *arguendo* that Plaskon et al. is prior art, it merely teaches the addition of carbon dioxide to a broke pulping slurry. There is no teaching of increasing alkalinity to control pH in the stock preparation and paper making process as defined in the claims.

For the same reasons indicated above, it is further submitted that the rejection of claim 8 is also in error and should be withdrawn.

Newly presented claims 14 -24 are also in condition for allowance for the same reasons as indicated above. These claims are further distinguished over the art for the following reasons.

Claims 14, 17, 19, 21 and 23 are further distinguished by the feed additions in a process wherein the paper making pulp suspension is provided or formed by adding water to bales of pulp or to pulp of increased consistency. In this manner, the inventive process is clearly limited to be downstream of or remote of the pulp mill processing. No prior art of record is urged by the Examiner to teach or suggest the same.

Claims 15, 18, 20, 22 and 24 are further distinguished by the alkalinity providing feed additions of sodium hydroxide of 0.5 to 5 kg/ton and carbon dioxide of 0.5 to 5 kg/ton of the dry cellulose in the pulp suspension. Said feeds counter each other's pH changing effect and an excess of sodium hydroxide or carbon dioxide over these amounts may be used for pH adjustment.

Newly presented claims 25 and 26 are also distinguished over the prior art by defining the alkalinity adjustment and pH control in a "papermaking pulp suspension in a paper mill after a pulp mill". No



prior art teaching of alkalinity to achieve pH stabilization in the claimed papermaking suspension is cited. Claim 26 further distinguishes over the art by claiming feed addition to the pulp and white water circulation.

Lastly, it is noted that in claims 1, 16 and 25 the word "throughout" has been used to more clearly indicate maintenance of pH during processing between feeds and paper making. This amendment was made in response to the issue of indefiniteness noted by the Examiner in the Advisory Action.

Claims 1-26 are in condition for allowance and such action is requested.

If there are any further fees required by this amendment not covered by the enclosed checks, or if no checks are enclosed, please charge the same to Deposit Account No. 16-0820, Order No. 32107.

Respectfully submitted,

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June 8, 2004

# **PULP & PAPER Dictionary**

**THIRD EDITION**

**BY JOHN R. LAVIGNE**

**TECHNICAL EDITING BY KEN L. PATRICK**



*To the pulp and paper industry  
in appreciation for providing me with  
the opportunity to be associated  
with people who have shared and made the  
pursuit of my career so enjoyable.*

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98 99 00 01 02 5 4 3 2 1

## PREFACE

## FOREWORD

## INTRODUCTION

## DEFINITIONS

## APPENDIX A

Bibliography

Magazines and Trade Journ

Standards and Data Sheets

## APPENDIX B

Conversion Tables

## ABOUT THE AUTHOR

## ABOUT THE EDITOR

board made to be treated with oil or

de especially to be wax- or oil-treated.  
s for use on mimeographs and similar

paper used to make duplicating sten-

tion area of a pulp mill in reference to  
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embossing a cross-grain design on its

s ready to make into paper. It may con-  
s, with or without suitable fillers, dyes,  
and stuff. (2) Paper suitable for a partic-  
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used to keep the fibers well-dispersed in  
mechanical stirring action.

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OCK PROPORTIONING.

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reparation phase of papermaking.

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iners.

der-type paper machine which takes the  
and spreads it across the width of the  
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**STOCK HOURS:** A paper machine production term used in some mills to refer to the actual time the stock ran on the wire (forming fabric) after deducting for other delay times.

**STOCK ITEMS:** Types of paper consisting of specific grades, sizes, weights, colors, and other characteristics that are kept in inventory by papermakers and/or merchants to fill orders for immediate shipment.

**STOCK ORDER:** An order for paper that can be filled from standard types of paper, called stock items, in a paper mill and/or merchant's inventory storage.

**STOCK PREPARATION:** The area of a paper mill where pulp is received from an on-site or off-site pulp mill, prepared for storage in slurry form, mechanically treated in beaters and refiners, mixed with other pulps, additives, dyes, and chemicals, and then cleaned and generally processed prior to sheet formation on the paper machine. Once known as the *beater room*.

**STOCK PROPORTIONING:** The process of mixing a variety of types of pulps, additives, dyes, and chemicals to make up a stock slurry satisfactory to meet the specifications of a particular grade of paper. Also called *stock blending*.

**STOCK PUMP:** A pump that moves pulp slurries through pipelines. It is sometimes specially designed for this purpose.

**STOCK REGULATOR:** A process control unit usually located in the stock preparation area just ahead of the paper machine to control the consistency of stock by adding water to it.

**STOCK ROOM:** (1) The section or room in a paper mill in which the finished reserve paper is stored. (2) The area of the mill where tools, spare parts, supplies, etc., are kept and distributed as needed by mill operation personnel.

**STOCK SIZES:** Paper and paperboard sizes established as standard for specific grades by the paper industry, and usually carried in inventory stock by paper mills and distributors.

**STOCK TROUGH:** A long, narrow, wooden conduit, used as a means of transporting paper stock flow in older paper mills, especially to the screens and paper machine.

**STOCK WEB:** A roll defect in which the layers tend to stick together due to poor adhesive coating, water, or some other sticky substance being caught up between the sheets.

**STOCK WEIGHTS:** Paper and paperboard weights established as standard for specific grades by the paper industry, and usually carried in inventory stock by the paper mills and distributors.

**STOCKLIGHT:** The time it takes for a red color to appear when a sample of paper is floated on thiocyanate solution, and a drop of ferric chloride is placed on its upper surface in testing for its water resistance.

**STOCKMAN:** A traditional reference to the employee in a paper mill who is in charge of the stock preparation operation and maintaining the stock supply to the paper machine.

**STOKER:** A series of stationary or moving grates at the bottom of a solid fuel burning furnace on which a bed of solids and ash is maintained for proper combustion.

# Dictionary of Paper

5th Edition

Edited by  
Michael Kouris

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**TAPPI PRESS**

## Table of Co

Dedication .....
Introduction .....
Acknowledgeme
Dictionary of Pu
Table 1: Metric I
Table 2: Relatio
Product
Table 3: Relatio
Product
Table 4: Gramm:
Table 5: Gramm:

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## STONE GROUNDWOOD (CONVENTIONAL)

**STICKIES**—Suspended particulate contaminants, usually of low specific gravity, in the finished pulp. These contaminants originate with the adhesive and coating residues, films, tapes, rubber-like particles, ink, and hydrolysis products of synthetic sizing materials. If not removed during processing, the stickies can cause sheets of paper to stick together. See also **RUBBER SPOTS**.

**STICK MARK**—(1) See **BACK MARK**. (2) Marks in coated paper caused by the rods or poles used in festoon drying. The term stick mark is not in current usage.

**STICK PAPER**—Paper which is rolled into a tight tube, generally with a starch "glue." Used for lollipops and cotton swabs for ears.

**STICTION**—In process control, an unpredictable binding characteristic of a final control element that imposes resistance to the control signal's ability to achieve repeatable response.

**STIFF BLADE COATING**—See **BEVELED BLADE COATING**.

**STIFFENER BRISTOL**—A piece of bristol board placed in envelopes to protect the enclosure from creasing or crushing.

**STIFFNESS**—The ability to resist deformation under stress. Resistance to a force causing the specimen to bend is termed bending or flexural stiffness. See also **RING STIFFNESS**.

**STIPPLING**—A type of embossing of paper to reduce the high gloss of a sheet by running the sheet between rollers with counter-grained surfaces. See **EMBOSED**.

**STITCH-THROUGH**—The process of mechanically bonding nonwovens using a form of knitting.

**STOCHASTIC SCREENING**—A digital screening process using very small dots of equal size and variable spacing.

**STOCK**—(1) Pulp that has been beaten and refined, treated with sizing, color, filler, etc., and

which after dilution is ready to be formed into a sheet of paper. (2) Wet pulp of any type at any stage in the manufacturing process. (3) Paper on inventory or in storage. (4) Paper or other material to be printed, especially the paper for a particular piece of work. (5) A paper suitable for the indicated use, such as coating raw stock, milk-carton stock, tag stock, towel stock, etc.

**STOCK ORDER**—An order to be filled directly from warehouse inventory of a standard grade, size, weight, and color, as opposed to a special making order (q.v.).

**STOCK PREPARATION SYSTEM**—The section of the papermaking process where the fibrous components are blended with the non-fibrous components of the furnish, and physically prepared for papermaking, typically by mechanical, chemical, or thermal treatment. The stock preparation system, traditionally, is considered to start at the high density storage chest discharge, in an integrated mill, or at the furnish pulper, in a non-integrated mill, and extend to the paper machine headbox. Broke reprocessing, especially the under-the-paper-machine broke pulpers, the white water system, the fines recovery system, and process control for all these areas are also considered to be within the stock preparation system.

**STOCK SIZES**—Common sizes of papers and boards which are usually stocked by producers, distributors, or consumers. They are sizes which are standard and which are reordered from time to time.

**STOCK WEIGHTS**—Common weights of papers and boards which are usually stocked by producers, distributors, or consumers.

**STOICHIOMETRY**—The branch of chemistry and chemical engineering that deals with the quantities of substances that enter into and are produced by chemical reactions.

**STONE CELLS**—See **SCLEREIDS**.

**STONE GROUNDWOOD (CONVENTIONAL)**—A method of prepar-

## CHAPTER 5

Ulrich Welse, Jukka Terho, and Hannu Paulapuro

# Stock and water systems of the paper machine

.....	155
.....	156
.....	157
.....	158
.....	158
.....	159
.....	160
.....	160
.....	161
.....	162
.....	162
.....	162
.....	164
.....	165
.....	166
.....	166
.....	167
.....	167
.....	170
.....	171
.....	171
.....	172
.....	174
.....	174
.....	175
.....	175
.....	177
.....	179
.....	180
.....	181
.....	183
.....	183
.....	184
.....	185
.....	185
.....	186
.....	187

### 1 Definitions

The following terms are commonly used to specify certain areas and systems as part of the entire paper mill water system:

**Short circulation:** The system in which paper machine wire water is separated from the stock in web forming and used for dilution of the thick stock to be delivered to the headbox.

**Long circulation:** The system in which excess white water from the short circulation and other waters are collected at the paper machine (PM) and used for stock dilution and other purposes in stock preparation. Within the long circulation loop, usually fiber recovery and water cleaning equipment is installed.

**Approach flow system:** The system extends from the machine chest to the headbox lip. The main purpose is to meter and dilute the stock including blending with other components like fillers, chemicals, and additives unless not already added in stock preparation. Then, the low-consistency stock is pumped and screened before feeding to the headbox. Stock cleaning by hydrocyclones and deaeration can be included.

**Stock preparation:** Stock preparation or "stock prep" includes mechanical treatment of the stock before the machine chest, proportioning, and blending of the main stock components. Stock preparation begins with repulping or the dilution of pulp from integrated mill operations at the pulp storage towers and ends at the machine chest.

### 2 Design principles

#### 2.1 Elements and operations

The purpose of the stock and water systems is to supply the paper machine (PM) with stock and water in such way that

- The quantity of supplied stock is sufficient for the production capacity of the PM
- The supply is even and of such quality in order to reach a high PM productivity
- The product at the reel meets the given quality parameters.



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future trends

## ***Book 8***

# **Papermaking Part 1, Stock Preparation and Wet End**

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